



Oil Impregnated Paper Bushings

Trench High Voltage Products Ltd., Shenyang

72.5 kV to 1100 kV
up to 5000 A
IEC60137
GB/T4109

Group Bushing Facilities

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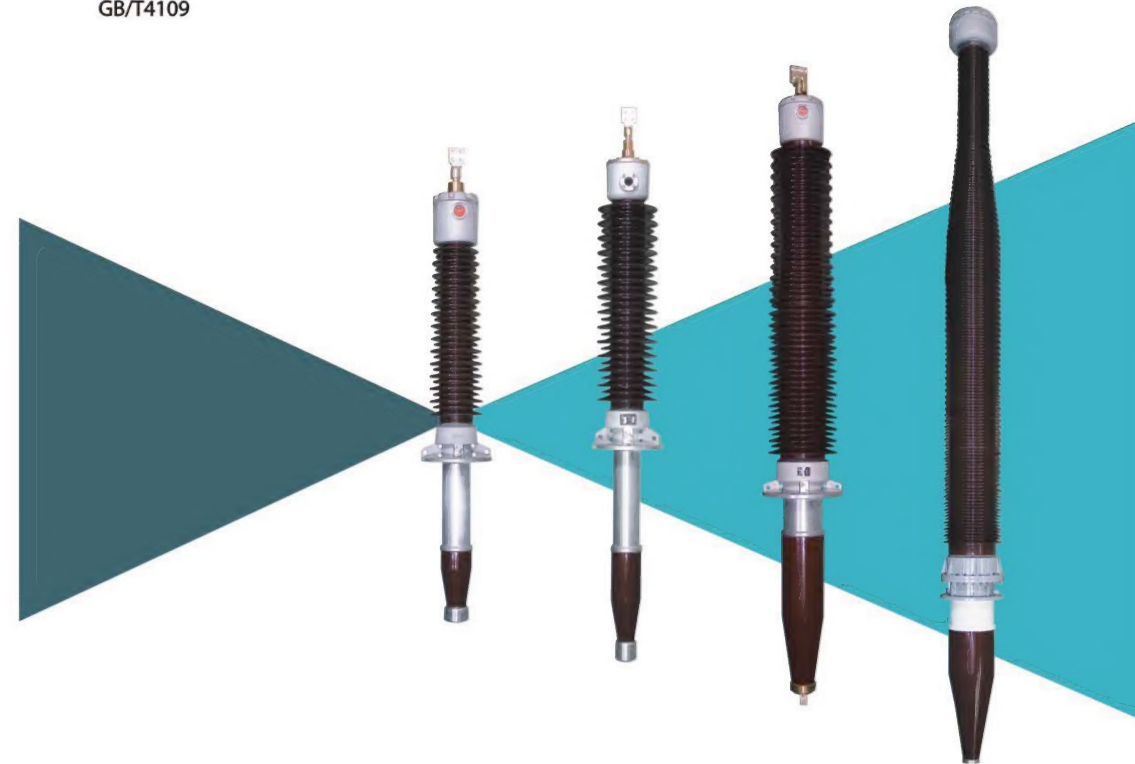
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Trench High Voltage Products Ltd., Shenyang (THVS) is a member of Trench group, a global leading manufacturer of HV transmission products. THVS uses the advanced design and processing techniques developed in Trench & Siemens and can supply 1100kV and below oil impregnated paper (OIP) and Epoxy resin impregnated paper (ERIP) bushings. Our products are designed and manufactured to IEC and ANSI where appropriate and world leaders in terms of quality and performance.

Facilities Include

- Products designed and manufactured to customer requirements.
- All bushings impulse tested as standard.
- Research and development and dielectric type testing to all national and international standards up to 3.2MV impulse, 1.5MV AC, 1.2MV DC in wet and dry conditions.
- Insulation studies and large-scale simulations.

Transformer Bushings

- Full range of designs for outdoor or indoor use.
- Oil and SF₆ connections.
- Insulation types include ERIP and OIP.
- OIP condenser bushings (type OTA) for medium/high power transformers.

Switchgear Bushings

- Epoxy resin impregnated paper condenser bushing for SF₆ insulated switchgear giving unrivaled mechanical and electrical performance up to 800kV.

Wall Bushings

- Total design and manufacture to customer requirements using epoxy resin.

Condenser Bushings for High Voltage Transformers

72.5kV to 1100kV up to 5,000A

Type OTA is a range of Oil Impregnated Paper condenser-type Transformer-to-Air bushings covering rated voltages from 72.5kV to 1100kV.

The bushings consist of a paper insulator wound onto a central tube or conductor, having aluminum foils inserted to give electrical stress grading through the insulation thickness and along its surface, producing an efficient, compact design.

The paper winding is enclosed within porcelain insulators at the outdoor and oil immersed ends and a central metallic housing which also provides the mounting flange. The wound core is impregnated with high-grade de-gassed mineral oil, following a carefully controlled heat and vacuum drying process.

Features

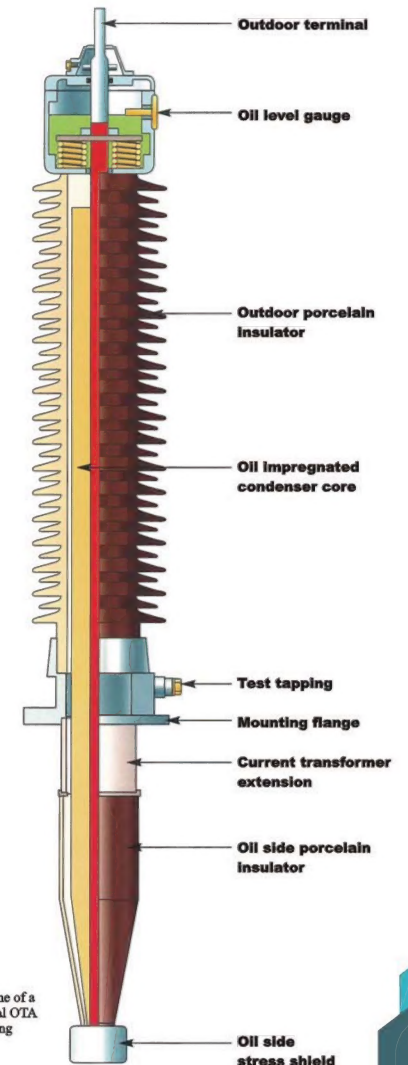
- Designed for transmission and distribution ratings in accordance with IEC 60137 and other international standards.
- Optimised construction to meet the latest Group II Classification For cantilever withstand load.
- Bushings may be installed up to 30° from vertical.
- Our proven reliability record with OIP condenser bushings guarantees extremely low partial discharge levels during transformer tests and partial discharge-free operation in service.
- Designs are provided to meet the most demanding pollution and heaving wetting conditions.
- Fixing flanges incorporate a test tapping for capacitance and tangent delta measurement.
- Transformer-end insulation is housed within a conical porcelain shell and terminated in an integral or detachable stress shield.
- Oil level indicators are provided on all bushings with magnetic indicators on bushings over 245kV.

Optional extras available on the voltage range 72.5kV to 245kV are:

- Current transformer accommodation extensions.
- Arcing horns.
- Special application outdoor porcelains.
- ANSI-type potential tapping.

Optional extras available on the voltage range 300kV to 1100kV are:

- As above, plus Air-end corona shield.



Type OTA Voltage Range 72.5kV to 245kV

Condenser bushings for
high voltage transformers

Type OTA Voltage Range 72.5kV to 245kV

Condenser bushings for
high voltage transformers

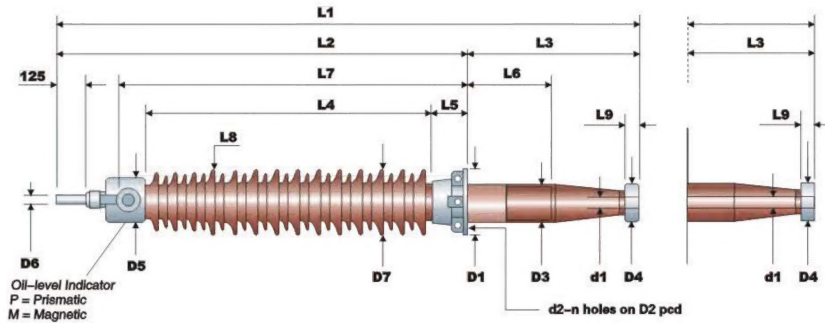


Figure 1b.

Figure 1a. Draw Lead Connection with Integral Stress Shield.

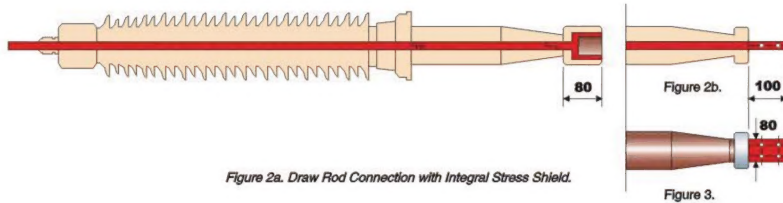
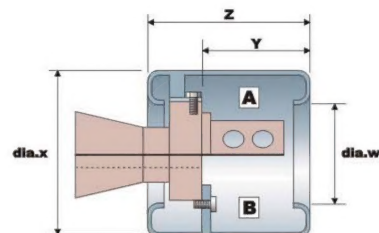


Figure 2b.

Figure 3.

Figure 2a. Draw Rod Connection with Integral Stress Shield.

Ur (kV)	Ir (A)	W	X	Y	Z	A	B
NOT REQUIRED FOR BUSHINGS WITH Fig. 1a & 2a CONNECTION ARRANGEMENTS							
72.5	1600						
123, 145	1250	120	170	150	205		B
170, 245							
72.5	100	3150	170	220	170	230	A
123, 145	3150	185	280	170	230		A
170, 245	800	120	170	55	110		B
NYLON - COATED STRESS SHIELDS							



REFERENCE		PERFORMANCE					DIMENSIONS																													
RATED VOLTAGE (kV)	RATED CURRENT (A)	RATED PHASE TO EARTH VOLTAGE (kV)	MAX POWER FREQUENCY WITHSTAND (kV)	LIGHTNING IMPULSE WITHSTAND (kVp)	CANTILEVERLOAD (kN)	TOTAL LENGTH	AIR-END LENGTH	OIL END LENGTH	STRING LENGTH	FLANGE LENGTH	MINIMUM EARTH BAND	LENGTH OF DRAWLEAD CONNECTOR	CREEPAGE DISTANCE (PROTECTED=0.42L8)	TERMINAL LENGTH	FLANGE DIAMETER	FLANGE PITCH CIRCLE DIAMETER	MAXIMUM DIAMETER OF OIL-END	TERMINAL DIAMETER	CONSERVATOR DIAMETER	STEM DIAMETER	PORCELAIN DIAMETER	BORE OF TUBE	DIAMETER OF FLANGE BOLT HOLE	NUMBER OF BOLT HOLES	OIL-LEVEL INDICATOR	CONNECTION ARRANGEMENT										
Ur	Ir	Uy	Up	Ui	F	L1	L2	L3	L4	L5	L6	L7	L8	L9	D1	D2	D3	D4	D5	D6	D7	d1	d2	n	P/M	Fig										
72.5	630	42	147	325	2	1955	1268	687	700	185	400	1053	2010	60	330	280	136	120	240	30	288	35	18	6	P	1a										
	2102					1298	804	700	195	400	1060	2010	110	400	350	166	145	240	40	313	60	18	6	P	1a											
	1600														1060	2010	110	330	280	166	145	240	40	313	60	18	6	P	1a							
	2000							3.15	1965	1245	720	690	205	300	*	2250	40	335	290	162	*	240	60	349	*	22	8	P	2b							
	2500															2010	40	335	290	162		240	60	313		22	8	P	2b							
	3150							4	2165	1245	920	690	205	500		2010	40	335	290	162		240	60	313		22	8	P	3							
	4000															2010	40	400	350	166		240	60	313		24	6	P	3							
	5000															2010	55	550	500	267		323	90	419		24	12	M								
	123				630	71	230	550	3.15	2550	1740	810	1152	205	400	1525	3390	60	400	350	173	120	240	30	314	35	24	6	P	1a						
2610		1770	840	1152	215					400	1535	3390	90	450	400	205	155	240	40	340	60	24	8	P	1a											
1600																3390	40	400	350	195	*	240	60	340	*	24	6	P	2b							
2000					4				2737	1717	1020	1152	215	500		3906	40	400	350	195		240	60	370		24	6	P	2b							
2500																3390	40	400	350	195		240	60	340		24	6	P	2b							
3150																3390	40	400	350	195		240	60	340		24	6	P	3							
4000																3390	40	400	350	205		240	60	340		24	6	P	3							
5000																3150	55	550	500	270		323	90	419		24	12	M								
145		630	84	275	650				3.15	2568	1848	720	1235	205	300	1585	3780	40	400	350	173	150	240	30	325	35	24	6	P	1b						
		2763								1828	935	1235	205	550	1585	3780	40	400	350	173	150	240	30	325	35	24	6	P	1b							
	1250															3135	1970	1165	1235	215	565	1700	3790	110	400	350	205	150	290	40	346	60	24	6	P	1a
	1600							4	3085	1910	1175	1235	215	600	*	3790	40	400	350	195	*	325	60	350	*	22	8	M	2b							
	2500															3790	50	400	350	195		325	60	350		22	8	M	3							
	4000															3790	50	450	400	240		325	60	380		22	12	M	3							
	170	630				98	325	750	3.15	2935	2110	825	1487	215	330	1845	4565	40	400	350	194	115	220	30	346	40	24	6	P	1b						
		3100								2225	875	1647	215	300	2005	4818	40	400	350	194	115	220	30	346	40	22	8	P	1b							
		1600										5	3310	2155	1155	1467	220	500	*	5120	50	450	400	241	*	325	60	408	*	22	12	M	2b			
2000																6930	50	550	500	270		323	60	419		24	12	M	3							
4000																4900	50	550	500	300		323	60	473		24	12	M	3							
245	630	142	480	1050	4	4090	2870	1220	2142	235	550	2585	6930	40	550	500	267	140	323	30	438	60	24	12	M	1b										
	3970					2870	1100	2142	235	430	2650	6930	40	550	500	267	140	323	30	438	60	24	12	M	1b											
	1600							5	4435	2870	1565	2142	235	340	*	8600	50	730	680	270	*	323	60	453	*	19	12	M	2b							
	2000															8600	50	550	500	270		323	60	453		24	12	M	3							
	2500															6930	50	550	500	270		323	60	438		24	12	M	3							
	3150															6930	50	550	500	270		323	60	438		24	12	M	3							
	4000															8600	50	550	500	300		323	60	473		24	12	M	3							
	5000															6930	55	550	500	315		385	90	470		24	12	M								

Type OTA Voltage Range 300kV to 1100kV

Condenser bushings for
high voltage transformers

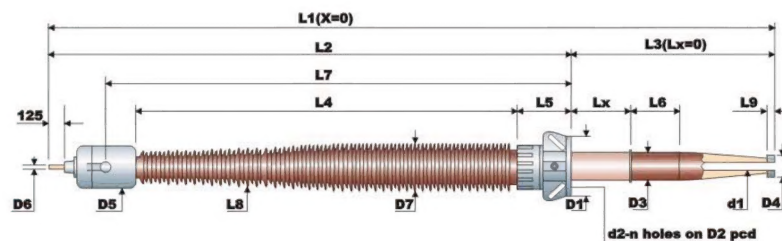


Figure 1. Draw Lead Connection

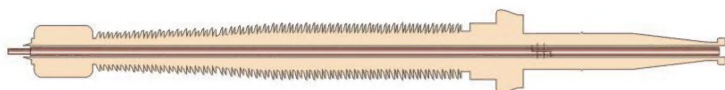


Figure 2. Draw Rod Connection

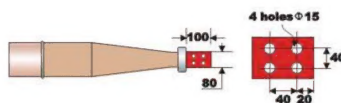
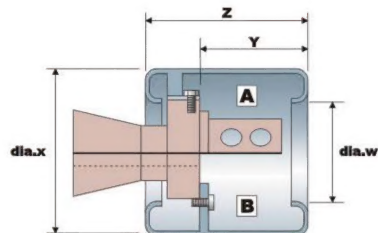


Figure 3. Direct Connection

Ur	Ir (A)	W	X	Y	Z	A	B
300	800	120	170	55	110	A	B
300	1250 & 3150	185	250	170	230	A	B
362	1600 & 3150						
362	1000	185	250	120	190	B	B
420	1000 & 1600	210	290	130	190	B	B
550							
420	1600 & 3150	210	290	230	290	A	A
550							
800		150	350	270	370	A	A

NYLON - COATED STRESS SHIELDS



A Screwed Fixing B Bolted Fixing

Type OTA Voltage Range 300kV to 1100kV

Condenser bushings for
high voltage transformers

REFERENCE							PERFORMANCE							DIMENSIONS																			
RATED VOLTAGE (kV)		RATED CURRENT (A)		WET SWITCHING IMPULSE WITHSTAND (kV)		RATED PHASE TO EARTH VOLTAGE (kV)		MAX. POWER FREQUENCY WITHSTAND (kV)		LIGHTNING IMPULSE WITHSTAND (kV)		CANTILEVER LOAD (kN)		TOTAL LENGTH	AIR-END LENGTH	OIL-END LENGTH	STRING LENGTH	FLANGE LENGTH	MINIMUM EARTH BAND	HEIGHT OF DRAW LEAD CONNECTOR	CREEPAGE DISTANCE (PROTECTED=0.42L)	TERMINAL LENGTH	FLANGE DIAMETER	FLANGE PITCH CIRCLE DIAM.	MAX.DIAMETER OF OIL-END	TERMINAL DIAMETER	CONSERVATOR DIAMETER	STEM DIAMETER	PORCELAIN DIAMETER	BORE OF TUBE	DIAMETER OF FLANGE BOLT HOLE	NUMBER OF BOLT HOLES	CONNECTION ARRANGEMENT
Ur	Ir	Us	Uy	Up	Ui	F	L1	L2	L3	L4	L5	L6	L7	L8	L9	D1	D2	D3	D4	D5	D6	D7	d1	d2	n	Fig							
362	630	950	210	625	1175	5	6650	4830	1820	3720	430	600	4525	13013	40	710	660	350	170	500	60	470	60	24	12	1							
	1250						6870	4830	1820	3720	430	600	4525	13013	40	710	680	350	170	500	60	470	60	24	12	1							
	2500						6510	4800	1710	3720	430	600	*	13013	50	710	660	395	*	500	60	562	*	24	12	3							
	3150						6620	4800	1820	3720	430	600		13013	50	710	660	395		500	60	562		24	12	3							
420	1250	1050	242	695	1425		6480	4830	1650	3720	430	430	4510	13013	40	710	680	395	170	500	60	562	70	24	12	1							
	1600						6585	4765	1820	3720	430	600	*	13013	50	710	680	345	*	500	60	470	*	24	12								
	4000						7170	5280	1890	4180	430	550		14755	55	710	660	395		500	90	562		24	12								
	5000						6920	5280	1640	4180	430	550		14755	55	710	680	395		500	90	562		24	12								
550	630	1175	318	740	1675		8097	6027	2070	4925	430	550	5730	19000	40	710	660	395	170	500	60	580	70	24	12								
	1250						7747	5457	2290	4355	430	600	5160	15243	40	810	750	395	170	500	60	562	70	24	16	1							
	1600						8144	6074	2070	4925	430	550	*	17380	40	710	680	395	170	500	60	562	70	24	12								
	2500						8550	6005	2545	4925	430	940		17380	50	710	680	395	*	500	60	562	*	24	12	3							
800	800	1675	462	1020	2350		7200	5260	1940	4180	430	550		14755	55	710	660	478		500	90	650		24	12	3							
	1250						10548	8360	2188	7108	500	550	*	24000	50	800	711	570	210	700	60	762		32	12								
	1600						10758	8360	2090	7108	500	570		27500	50	780	711	570		700	60	762		32	12								
	2500						10815	8577	1950	7325	500	600		27500	50	800	711	570		700	60	762		32	12								
1100	2000	1950	636	1200	2400	10815	8577	1950	7325	500	600		27500	50	800	711	570		700	60	762		32	12									
						13625	11070	2230	9500	500	380		33000	50	1020	950	765	265	900	80	950		36	16									
						13270	10826	2562	9500	500	600		33000	50	1020	950	640	265	900	80	800		36	16									